Remarks/Arguments

Applicants have received and carefully reviewed the Office Action of the Examiner mailed April 15, 2009. Currently, claims 1-27 remain pending. Claims 1-12 and 15-27 have been rejected and claims 13 and 14 have been objected to. Favorable consideration of the following remarks is respectfully requested.

Allowable Subject Matter

Applicants thank the Examiner for indicating that claims 13 and 14 would be allowable if rewritten in independent form including all of the elements of the base claim and any intervening claims.

Claim Rejections – 35 USC § 103

On page 2 of the Office Action, claims 1-12 and 15-27 were rejected under 35 U.S.C. 103(a) as being unpatentable over Christiansen (U.S. Patent No. 5,172,654) in view of Chan et al. (U.S. Patent No. 3,387,589). After careful review, Applicants must respectfully disagree.

Turning first to claim 1, which recites:

> 1. (Previously Presented) A computer implemented method of operating a boiler system having a plurality of stages which may be active or inactive at a given time, the stages having outputs, the method comprising:
>
> performing a staging sequence, at a first interval, to determine how many of the plurality of stages should be active;
>
> modulating a first stage, at a second interval shorter than the first interval, to operate at less than 100% of its output; and
>
> modulating a second stage, at a third interval shorter than the first interval, to operate at less than 100% of its output;
>
> wherein the first and second stages are modulated while both stages are active.

In formulating the rejection, the Examiner asserts that Christiansen discloses all of the limitations of the claims except for various activation intervals which the Examiner relies on Chan et al. to provide. Applicants respectfully disagree. Independent claim 1 recites a computer implemented method involving the method steps of performing a staging sequence, at a first interval, to determine how many of the plurality of stages should be active, modulating a first stage, at a second interval shorter than the first interval, to operate at less than 100% of its output, and modulating a second stage, at a third interval shorter than the first interval, to operate at less than

100% of its output, wherein the first and second stages are modulated while both stages are active. Neither Christiansen nor Chan et al., taken alone or in combination, appear to teach or suggest many of these elements.

Christiansen appears to be directed towards a microprocessor-based boiler controller. Christiansen appears to disclose, upon start-up, a first boiler is activated. The first boiler appears to operate singly until the firing rate reaches a user defined "Add Boiler" setpoint. When the firing rate of the first boiler reaches the "Add Boiler" setpoint, an additional boiler is fired. Once the second boiler is operational, the first boiler appears to operate at a predetermined firing rate where the first boiler exhibits optimal efficiency. Nowhere does Christiansen appear to teach or suggest the specific method recited in claim 1 including the step of performing a staging sequence, at a first interval, to determine how many of the plurality of stages should be active, and then modulating a first stage, at a second interval shorter than the first interval, to operate at less than 100% of its output and modulating a second stage, at a third interval shorter than the first interval, to operate at less than 100% of its output, as recited in claim 1. Instead, Christiansen appears to disclose the immediate activation of a first boiler followed by subsequent activation of additional boilers once the first boiler has reached a certain "Add Boiler" setpoint. The Examiner has not indicated where Christiansen is believed to disclose the various features of claim 1.

Chan et al. do not appear to teach that which Christiansen lacks. Chan et al. appears to be directed towards a control system for a multiple boiler system. Chan et al. appear to teach a first boiler in operation and additional boilers added or subtracted as needed. The boiler system appears to have a desirable operating pressure (e.g. 175 – 200 psi). As the system approaches the lower limit, the boiler may operate at a high firing rate and as the system approaches the higher limit, the boiler may operate at a low firing rate. It appears that additional boilers may be added if the system cannot maintain the desired pressure and if the pressure is too high, boilers may be removed.

In formulating the rejection, the Examiner asserts Chan et al. disclose the various activation intervals of claim 1 (presumably, the first, second and third intervals of claim 1). Applicants respectfully disagree. Chan et al. appear to disclose a time delay occurs between the pressure reading indicating a boiler change is necessary and the subsequent activation/ deactivation of a boiler. The time delay appears to prevent unnecessary cycling of the boilers

when the pressure change is only due to a temporary drop or rise. Nowhere do Chan et al. appear to teach or suggest the specific method of performing a staging sequence, at a first interval, to determine how many of the plurality of stages should be active, and then modulating a first stage, at a second interval *shorter than the first interval*, to operate at less than 100% of its output, and modulating a second stage, at a third interval *shorter than the first interval*, to operate at less than 100% of its output, as recited in claim 1. Instead, Chan et al. appear to merely disclose a first boiler as being active, followed by subsequent activation of additional boilers depending on the pressure in the system, with a delay added to help prevent unnecessary cycling of the boilers when the detected pressure change is only due to a temporary drop or rise. The delay of Chan et al. appears to simply delay the activation of a boiler, but does not appear to relate in any way to an "interval" used for modulating the firing rate of the various boilers. Further, Chen et al. do not appear to teach any relationship between, for example, a first interval for performing a staging sequence, with the second interval for modulating a first stage and a third interval for modulating a second stage.

In formulating the rejection, the Examiner asserts, "[h]ence, one skilled in the art would find it obvious to modify the system of Christiansen to include the various activation intervals of Chan et al. for the purpose of pressure stabilization." Applicants respectfully disagree. The Supreme Court in *KSR Int'l Co. v. Teleflex Inc.* quotes *In re Kahn*, 441 F. 3d 977, 988 (CA Fed. 2006):

> "[R]ejections on obviousness grounds cannot be sustained by mere conclusory statements; instead, there must be some articulated reasoning with some rational underpinning to support the legal conclusion of obviousness".

Applicants submit that the Examiner's conclusion of obviousness lacks the necessary articulated reasoning with rational underpinning. Even if one were to combine the system of Christiansen with the time delay of Chan et al., one would not arrive at the method as claimed. At best, the system of Christiansen would be modified to include a short time delay when the first boiler of Christiansen reaches the "Add Boiler" setpoint. Neither Christiansen nor Chan et al., taken alone or in combination, appear to teach or suggest the specific method recited in claim 1 including performing a staging sequence, at a first interval, to determine how many of the plurality of stages should be active, and then modulating a first stage, at a second interval *shorter than the first interval*, to operate at less than 100% of its output, and modulating a second stage, at a third

interval *shorter than the first interval*, to operate at less than 100% of its output. Thus, even if one were to combine Christiansen and Chan et al., one would not arrive at the method as claimed. Furthermore, there appears to be no motivation, suggestion or other reason for one of ordinary skill in the art to modify Christiansen or Chan et al. to arrive at the method as claimed. For these and other reasons, claim 1 is believed to be clearly patentable over Christiansen in view of Chan et al. For similar and other reasons, claims 2-7, which depend from claim 1 and add significant additional distinguishing features, are also believed to be clearly patentable over Christiansen in view of Chan et al.

Turning now to claim 8, which recites:

> 8. (Currently Amended) A computer implemented method of providing heat capacity in response to a heat load using a boiler system having a plurality of stages that may be active or inactive at a given time, the method comprising:
>
> performing a staging sequence, at a first interval, to determine which of the plurality of stages should be active or inactive, resulting in a number of determined active stages;
>
> activating the determined active stages, if any; and
>
> when the determined active stages includes two or more of the plurality of stages, modulating the active stages, at a second interval shorter than the first interval, while they are active.

As can be seen, claim 8 recites, in part, a computer implemented method involving the method steps of performing a staging sequence at a first interval to determine which of the plurality of stages should be active or inactive resulting in a number of determined active stages and activating the determined active stages. Claim 8 further recites when the determined active stages includes two or more of the plurality of stages, modulating the active stages, at a second interval shorter than the first interval, while they are active. As discussed previously, nowhere do Christiansen or Chan et al. appear to teach or suggest many of these features. Thus, for similar reasons to those discussed above, as well as other reasons, claim 8 is believed to be clearly patentable over Christiansen in view of Chan et al. For similar and other reasons, claims 9-11, which depend from claim 8 add significant additional distinguishing features, are also believed to be clearly patentable over Christiansen in view of Chan et al.

Turning now to claim 12, which recites:

> 12. (Previously Presented) A computer implemented method of operating a boiler system having a plurality of stages which may be active or inactive at a given time, the method comprising the steps of:

performing, at a first interval, a staging sequence to determine how many of the stages should be active; and

performing, at a second interval shorter than the first interval, a modulating sequence to modulate the active stages.

Claim 12 recites, in part, the steps of performing, at a first interval, a staging sequence to determine how many of the stages should be active; and performing, at a second interval shorter than the first interval, a modulating sequence to modulate the active stages. As discussed previously, nowhere do Christiansen or Chan et al. appear to teach or suggest these features. As such, and for similar reasons to those discussed above, as well as other reasons, claim 12 is believed to be clearly patentable over Christiansen in view of Chan et al. For similar and other reasons, claims 15-16, which depend from claim 12 and add significant additional distinguishing features, are also believed to be clearly patentable over Christiansen in view of Chan et al.

Turning to claim 17, which recites:

17. (Previously Presented) A computer implemented method of controlling a multi-stage boiler system having a number of stages that can be either active or inactive, the method comprising the steps of:

determining whether to make an inactive stage active; and

determining whether to make an active stage inactive; wherein:

a first delay is provided after making an inactive stage active,

a second delay is provided after making an active stage inactive, and

the first delay is longer than the second delay.

As can be seen, claim 17 recites the steps of: determining whether to make an inactive stage active; determining whether to make an active stage inactive; wherein: a first delay is provided after making an inactive stage active, and a second delay is provided after making an active stage inactive, wherein the first delay is longer than the second delay. Nowhere do Christiansen or Chan et al. appear to teach or suggest these features. If the Examiner elects to maintain this rejection, the Applicants respectfully request that the Examiner specifically point out where Chan et al. teaches, for example, "the first delay is longer than the second delay". As such, and for similar reasons to those discussed above, as well as other reasons, claim 17 is believed to be clearly patentable over Christiansen in view of Chan et al.

Turning to claim 18, which recites:

18. (Previously Presented) A computer implemented method of staging and modulating a boiler system in response to a load comprising the steps of:

staging and modulating the system using a first control method that is adapted for achieving increased efficiency under a first set of conditions; and staging and modulating the system using a second control method that is adapted to allow cycling of the stages under a second set of conditions.

In formulating the rejection, with particular reference to claims 9 and 18-27, the Examiner asserts:

> Where a claimed improvement on a device or apparatus is no more than 'the simple substitution of one known element for another or the mere application of a known technique to a piece of prior art ready for improvement,' the claim is unpatentable under 35 U.S.C. 103(a). Ex Parte Smith, 83 USPQ.2d 1509, 1518-1519 (BPAI, 2007) (citing KSR v. Teleflex, 127 S.Ct. 1727, 1740, 82 USPQ2d 1385, 1396 (2007)). Accordingly the applicant has claimed varying levels of modulation. Applicant claims a combination that only unites old elements with no change in the respective functions of those old elements, and the combination of those elements yields predictable results; absent evidence that the modifications necessary to effect the combination of elements is uniquely challenging or difficult for one of ordinary skill in the art, the claim is unpatentable as obvious under 35 U.S.C. 103(a). Ex Parte Smith, 83 USPQ.2dat 1518-19 (BPAI, 2007) (citing KSR, 127 S.Ct. at 1740, 82 USPQ2d at1396.

This is not understood. The claims are not directed solely to varying levels of modulation as the Examiner suggests, or the mere simple substitution of one known element for another. These appear to be merely conclusory statements with no support. Claim 18 in fact recites a specific computer implemented method, with specific method steps. More specifically, claim 18 recites a computer implemented method of staging and modulating a boiler system in response to a load comprising the steps of: staging and modulating the system using a first control method that is adapted for achieving increased efficiency under a first set of conditions; and staging and modulating the system using a second control method that is adapted to allow cycling of the stages under a second set of conditions. The Examiner has not established that any of these elements are known elements.

Neither Christiansen nor Chan et al., taken alone or in combination, appear to teach or suggest such a method. As discussed above, both Christiansen and Chan et al. appear to activate a first boiler and subsequently activate and deactivate additional boilers as needed based on an "Add Boiler" setpoint or a detected pressure. Neither Christiansen nor Chan et al. appear to teach or suggest staging and modulating the system using a first control method that is adapted for achieving increased efficiency under a first set of conditions; and staging and modulating the

system using a second control method that is adapted to allow cycling of the stages under a second set of conditions as currently claimed.

Thus, even if one were to combine Christiansen and Chan et al., one would not arrive at the method as claimed. Furthermore, there appears to be no motivation, suggestion or other reason for one of ordinary skill in the art to modify Christiansen or Chan et al. to arrive at the method as claimed. For these and other reasons claim 18 is believed to be clearly patentable over Christiansen in view of Chan et al. For similar and other reasons, claims 19-24, which depend from claim 18 and add significant additional distinguishing features, are also believed to be clearly patentable over Christiansen in view of Chan et al.

Turning now to claim 25, which recites:

> 25. (Previously Presented) A computer implemented method of performing a staging sequence for a multi-stage boiler system in which at least one stage can be either active or inactive, the method comprising the steps of:
> observing an error measured as a difference between a temperature and a setpoint;
> observing a rate of change of the error; and
> combining the error and the rate of change of error to determine whether:
> an inactive stage should become active;
> an active stage should become inactive; or
> no change in the number of active stages is necessary.

Independent claim 25 recites a computer implemented method of performing a staging sequence for a multi-stage boiler system in which at least one stage can be either active or inactive, the method comprising: observing an error measured as a difference between a temperature and a setpoint; observing a rate of change of the error; and combining the error and the rate of change of error to determine whether: an inactive stage should become active; an active stage should become inactive; or no change in the number of active stages is necessary (emphasis added). Nowhere do Christiansen or Chan et al., taken alone or in combination, appear to teach or suggest these specific method steps. The Examiner has not provided a detailed response indicating where either Christiansen or Chan et al. is considered to teach or suggest such steps. As discussed above, both Christiansen and Chan et al. appear to activate a first boiler and subsequently activate and deactivate additional boilers as needed based on an "Add Boiler" setpoint or a detected pressure. Nowhere do either Christiansen or Chan et al. appear to teach, disclose or suggest a method comprising: observing an error measured as a difference between a temperature and a setpoint; observing a rate of change of the error; and combining the error and

the rate of change of error to determine whether: an inactive stage should become active; an active stage should become inactive; or no change in the number of active stages is necessary, as recited in claim 25. For these and other reasons, claim 25 is believed to be clearly patentable over Christiansen in view of Chan et al. For similar and other reasons, claims 26-27, which depend from claim 25 and add significant additional distinguishing features, are also believed to be clearly patentable over Christiansen in view of Chan et al.

Conclusion

It is believed that all pending claims 1-27 are in condition for allowance. Reconsideration and reexamination are respectfully requested. If a telephone conference would be of assistance, the Examiner is encouraged to contact the undersigned attorney at 612-359-9348.

Respectfully Submitted,

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